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## THE RECENT BIRD TRACKS OF THE BASIN OF MINAS.

BY C. FRED. HARTT, A. M.

Almost in the very heart of Nova Scotia is the Basin of Minas, a beautiful sheet of water communicating with the head of the Bay of Fundy by a narrow strait. It is triangular in shape, the longer, or northern shore being about sixty miles in length, running nearly east and west, skirting the Cobequid hills. The western or shortest side runs about north and south, along the edge of the fertile New-Red Sandstone district of Cornwallis, known as the "Garden of Nova Scotia," or "Corn-and-potatoes-wallis." At the southern angle of the triangle enter two rivers, or, more properly, estuaries; the Cornwallis, which comes from the west, and the Avon, which enters from the south-east. Between the mouth of these two rivers is the Grand Pré, the home of Evangeline, rendered celebrated by the delightful poem of Longfellow.

The scenery of this part of Nova Scotia is very picturesque and beautiful. Almost at the mouth of the Cornwallis is the pretty little village of Wolfville, the seat of Acadia College. From the cupola of that Institution we

look over nearly the whole Basin and the surrounding country. In front of us is the Basin; to the left, somewhat, Cornwallis, with its low, undulating lands dotted with farms and farm-houses, and beyond, the North mountains that border the whole southern shore of the Bay of Fundy like a wall, breaking down abruptly on the western shore of the Basin of Minas, forming a noble promontory, Cape Blomidon, whose bright red sandstone cliffs and frowning trap-crags are not less grand than the Palisades of the Hudson. We see the high ridge of the Cobequids stretching along the northern shore eastward as far as the eye can reach, while just east of the Avon are the Carboniferous hills of Cheverie, and on our right and almost at our very feet is the Grand Pré.

At Halifax, and along the Atlantic shore of Nova Scotia, the tide rises but a few feet; but, as every one knows, the rise at the head of the Bay of Fundy amounts sometimes to seventy feet.

Arriving at Halifax by steamer, we take the cars to Windsor, a little town on the Avon, a few miles above its mouth, whence a small steamer plies to St. John, New Brunswick. We arrive two or three hours before the steamer is expected in. There is a crowd on the wharf, and we go down to see what is the matter, but to our astonishment we see a wide, deep valley, like a great mud ditch, and no water, except a narrow stream, excessively turbid, which meanders over the expanse of soft chocolate-colored mud and sand at the bottom. At the foot of the wharf, which is some twenty or more feet high, a bank of soft mud, scored with trough-like depressions made by the keels of vessels, slopes off ten feet further to the bed of the river. Vessels lie high and dry at the wharves, and—Where is the water?

Below Windsor, one looks down the river some distance, and then the view is shut off by an eastward bend. By and by we see something white making its appearance at this point. It is advancing up the stream, and there is a gleam of water behind it. Some one who has also been on the lookout exclaims, "Here comes the tide!" We see it coming steadily up the channels, with a line of foam* along its front. It rushes swiftly by us, passes under the long bridge that spans the Avon just above the town, and is out of sight. Meanwhile the whole bottom of the depression is flooded, and the water is pouring in like a river. It creeps visibly up the edges of the mud banks, gains the bases of the piers, and sweeps out higher and yet higher the sun-dried, muddy fronds of the coarse, knotty-leaved fuci, that hang heavily from the pier. As we watch the flood eddying and rippling along the sides of the wharves, gaining steadily and visibly in height every moment, we can scarcely repress the question, Where will it stop? But a little while ago we looked down the river and saw it as a great empty mud ditch. Now it is a broad expanse of water, that would be beautiful, were it not that its waves are excessively turbid, and of a coffee, or rather chocolate, color, contrasting strangely with the green meadows and cultivated hillsides that border it. There is a little fleet of vessels too, that is being borne in on the current, and presently some one cries out, "Here she comes!" There is a long black line of smoke issuing from beyond the elms on the point, and in a moment the little bay steamer makes her appearance, and is soon blowing off steam alongside of the pier. Meanwhile the tide has risen so as nearly to fill

*The shape of the estuary of the Peticodiac, in New Brunswick, is such as to cause the formation of a "bore," or high wave, that sweeps violently up the channel in its narrow part in advance of the tide.

the channel. An hour afterwards, when the boat leaves, the marsh meadows are overflowed, and all the bordering flat lands would be deluged, were they not protected from the flood by a line of embankments, called "dykes." Away goes the steamer with the turn of the tide, a few little vessels drop down on its current, and five hours afterwards little boys wade across in the mud above the bridge to avoid paying the toll.

The northern and southern shores of the Basin of Minas are bordered by bluffs of Lower Carboniferous sandstone and shale, and soft, bright-red beds of clayey sandstone belonging to the "New-Red" or Trias formation of geologists. The western shore is wholly composed of this latter rock.

One would expect that the action of tidal currents, such as we have described, combined with the amount of surface exposed to wave-action, between high and low water, would cause a great wear of the coast; and such is the case, both in the Bay of Fundy and the Basin of Minas. Frosts heave off every year great masses from the trap cliffs of Blomidon, or the shale and sandstone bluffs of the coast of the Basin, and every year sees them more or less completely removed, by the joint action of currents and floating ice. The wear and tear of the softer rocks furnishes a copious fine red mud, which is distributed by the currents over the whole bay.* During the intervals between ebb and flow, when the waters are stationary, this sediment that is deposited forms extensive banks, exposed over large tracts along the shores at low tide. Each tide adds its layer to these banks and sloping shores, sometimes but an exceedingly thin film, at others, espec-

*This mud is also borne by the Bay of Fundy current along the coast of Maine even, as we have been informed by fishermen, as far as the mouth of the Kennebec River. — EDITORS.

ially after stormy weather, amounting to a quarter of an inch or more. The layer formed by a night tide is said to be thicker than that deposited by a day tide. The mud banks, as well as the flat marsh-lands bordering the Basin, especially in Horton and Cornwallis, are composed of this material. Where large tracts had reached such a height as to be covered by only a few feet of water at high tide, the inhabitants, to whom the French Acadians set the example, have dyked them in, and as the "marsh mud" forms a very fertile soil, these dyked lands are very valuable. A little island lay a couple of miles from the southern shore of the bay, between the mouth of the Avon and Cornwallis. Mud accumulated between it and the main land, and as the deposits increased, it at last formed a marsh joining the island to the shore. The French Acadians dyked this in, and the great meadow thus formed was the Grand Pré, where Basil toiled in the forge and paid court to Evangeline.

It is a beautiful day in June: let us pay a visit to the Cornwallis River, near Wolfville. The dyked land here, planted with oats and grass, potatoes, etc., is but a narrow strip bordering the river. We cross it, observing the regularly laid-out ditches used to collect the surface water, and carry it off by sluices through the dykes, which is merely a mud wall a few feet in height, sufficient to keep out the waves at high tide. Outside this wall we find a flat area, in part bare and muddy, partly sedge-covered. Deep gullies are cut in it by the water as it is drained off, and at their bottoms we see immense numbers of coarse black-looking little shells (*Nassa obsoleta* Say) crawling about. We find also a great many specimens of a kind of mussel, with a furrowed shell (*Modiola plicatula* Lamk.), half buried in the mud. Occasionally a

clam shell turns up (*Mya arenaria* Linn.), and perhaps a little thin round and flat shell (*Macoma fusca* Say), while a little univalve shell (*Littorina rudis* Mont.) is not uncommonly found attached to the blades of sedge. "Fudge!" says our companion, looking at his but half-visible boots, "we might have chosen a better locality for an excursion than this. Let's go back for a ramble among the hills." "Not so fast, my friend, we've come down here to take a lesson from Nature, and we'll find something interesting by and by." By dint of wading through the mud, leaping across ditches, an exploit rendered somewhat difficult owing to the tenacity of the mud, which makes jumping out of one's boots something easy to accomplish, we reach a sedgy tract, and this crossed, we are by the side of the river. The tide is out, and a scene like that we witnessed on the Avon, at Windsor, meets the eye. The bank slopes rather steeply from its top to the bed of the river. The warm sun has dried and cracked the mud on the surface along the upper edge of the bank, and it is divided into polygonal pieces by a network of cracks, like that of a dried up mud-puddle, and the upper layers are curled up a little so as to be partially separated from those underneath. This cracked and dried part forms a zone running along the whole bank, and extending downwards some distance below high tide mark. In the lower part the bank is always soft. Crack! goes a gun. We look around and see a sportsman not far off, the blue wreath of smoke from his piece fast drifting over the dyke, while an immense flock of "Marsh Peeps" (*Tringa minuta*), is whirling around him, now almost invisible, now flashing up like a cloud of snow-flakes, as they take a different tack, exposing their white breasts. In certain seasons of the year this little bird is very numerous on this shore,

together with several other species of waders, and large flocks of them may be seen running busily about over the mud flats, searching for worms, crustaceans, etc.

The baked mud of the upper zone is at present too hard to retain the impressions of their footsteps, while that near the bottom of the slope is too soft. The middle zone, with its smooth, glossy, partially dried surface, is eminently fitted to receive and retain the most delicate impressions, and it is covered all over with the long zig-zag lines of their little three-toed tracks. We distinguish readily the tracks of other species of birds that have run over the same surface. Here is the large three-toed impression of the foot of the Great Blue Heron, which we frightened away when we came up, and which is now wading about leisurely along the edge of a sand-bank in the middle of the river. Here are also tracks of crows and dogs, and here, the deep, brokenly-cut hoof-prints of a cow. There are tracks both of booted and barefooted gunners. See! these impressions were made by a person walking leisurely, but if you will follow them on a little you will find that they begin to be suddenly farther apart, and the toe becomes more deeply impressed. A sportsman has stolen quietly up to a flock of "Peeps," fired, and then run to pick up his game. Here we find great numbers of tracks made by the flock into which he fired; and we see, also, the long grooves made by the shot. There are feathers lying about, and we can tell from the different directions in which he ran, that he has shot and picked up half a dozen birds.

Let us now go up the slope a little further, to where the mud is dry and cracked. On this hardened surface we find the tracks of birds that ran over it a couple of hours ago, when it was still soft. We scale off a few

pieces of the upper layer to carry away with us as a specimen, and in doing so discover that there are tracks of the same kind on the next layer underneath. On a previous day the birds ran about over the mud as to-day, leaving the impressions of their feet; these hardened in the sun; the tide came up softly and flowed over them, depositing a new layer of mud upon them, thus preserving them. This layer is pitted with little pear-shaped impressions. "Why! these must be rain prints," suggests our companion, who has begun to be interested in mud-studies, "and the storm must have come from the west too, because the prints are not round but pear-shaped, and from the direction in which the small end of the impression is turned, you can see whence the wind was blowing at the time; besides, the shower could not have lasted long else it would have made the mud too soft, and none of the prints would have been preserved. By the bye, we had a slight shower this morning, just a little while after the tide was full. I'll venture that near high tide mark we shall find some record of it. Yes! here they are, and these, too, are not round, for you remember that there was a smart breeze blowing at the time, and so the drops struck slantingly, making oblong impressions, the smaller ends of which are directed to the point of the compass from which the wind blew." Shells, bones of fish and other animals become buried in these beds, together with the remains of plants, leaves of trees, pine cones, or other fruits; but it is an exceedingly rare thing to find on these flats a dead bird, unless it is one which has been killed by a sportsman. — *Concluded in next number.*

# THE HABITS OF THE GORILLA.

BY W. WINWOOD READE.

NEW ENGLAND has the honor of having discovered this celebrated ape. The first specimen was brought to Boston by Dr. Savage. It was discovered by Professor Jeffries Wyman, and named by him after the wild men (*gorillæ*) which Hanno mentions.

Professor Wyman, however, advanced no hypothesis as to their identity. It has recently been suggested, and even asserted, that the gorilla of Hanno, and the gorillas of the present day are the same. But that is a conjecture, not *impossible* indeed, but incapable of anything like proof.

Hanno, a Carthaginian, made an exploring voyage down the west coast of Africa. His log, or Periplus, has been preserved. He records the number of days occupied by his voyage, mentions its chief incidents, and describes the features of the coast sometimes with minuteness. The two great authorities upon the Periplus are Gosselin (*Geographie des Anciens*) and Rennell (*Geography of Herodotus*). The former, a sceptic, will not allow that Hanno sailed beyond the limits of the Barbary coast; an hypothesis to be rejected: while Rennell, evidently desirous of taking him as far as he can, fixes the end of his voyage at a little below Sierra Leone. Now the chimpanzee is found in that region; but the gorilla is found only close to the equator. In the first place, therefore, Hanno's voyage must be stretched to the equator.

Allowing that he did reach the equator, and that the volcanic peak of Fernando Po was the Currus Deorum, "the flames of which seemed to touch the sky," another

difficulty remains to be disposed of. He says that the gorillæ defended themselves with stones, and escaped over the precipices. Now there are no precipices on the coast of the gorilla country, and the gorilla of the nineteenth century is not in the habit of throwing stones.

The northern limit of its *habitat* I ascertained to be Cape St. John. I have not penetrated to its southern limit, but it is probably Loango. No good reason can be assigned why the gorilla should not be found wherever the chimpanzee is found; but specimens of the former have not yet been procured from the backwoods of Sierra Leone and Liberia, where the latter ape is met with frequently enough. How far east the gorilla country extends is of course unknown. The Fans are the most inland tribe at present known east of the Gaboon. They told me that in the distant country to the north-east whence they came, the gorilla (*ngi*) was more common than in the Gaboon; so common that they could sometimes hear his cry from their towns.

The gorilla moves from place to place, but is almost always found in the thickest part of the virgin forest. His migrations, if they can be so called, are probably determined by the food seasons. He is very partial to one or two kinds of fruit. I was also shown a kind of grass growing in small tufts; wherever that grass grows, the gorilla is found.

Waterton says that the *monkeys have no home*. This is certainly true of the gorilla and of the other anthropoid apes, and it is this which renders it so difficult to shoot them in a country which is one vast forest, with here and there a meadow or a marsh. The gorilla builds a nest, it is true, but not as a residence. The male arranges this rude bed of boughs when the female is pregnant; she is

confined on it, and it is then deserted. Possibly a gorilla might be detected sleeping in one now and then, as birds often roost in old nests, but it is not made for that purpose.

The gorilla is partly terrestrial in its habits. It moves on all fours, sometimes assuming the erect position, but with difficulty, and only for a short time. As it goes along it breaks the branches of trees on either side; sometimes it ascends a tree to feed upon the fruit. The plantations of the natives are usually at some distance from their villages; the gorilla frequently visits them to eat the plantain and the sugar-cane, especially at morn and eve. At night it chooses a large tree to sleep in. Its ordinary cry is of a plaintive character; when enraged, it is a kind of bark, or short, abrupt roar. It does not attack man without provocation. When assailed or wounded, it charges on all fours, seizes the offensive object, bites it, and immediately retreats.

The gorilla is polygamous, and the male is frequently solitary; in fact, I have never seen more than one track at a time: but there is no doubt that both gorillas and chimpanzees are also found in bands. The males are said to fight with one another in the rutting season. The dung is like that of man, but notched in a peculiar manner. There appears to be little difference in the habits of the gorilla and the chimpanzee. The former ape is confined to a smaller area, at least as far as we know. The chimpanzee is said by the natives to be more intelligent, and less ferocious. They also, though feeding on the same kind of food, appear to prefer different sorts; for which reason it is, probably, that they are found in different localities.

I have seen one young gorilla in a state of captivity; it

was as docile as the young chimpanzee, which I also saw. It has been asserted, however, on good authority, that the young gorilla is sometimes perfectly untamable. All the authorities upon the habits of the gorilla are cited by Professor Huxley in his "Man's Place in Nature," with the exception of a curious passage in Monboddo's "Origin and Progress of Language" (vol. i. p. 281). M. Du Chaillu, in his "Journey to Ashango Land," also gives some details which are interesting, rather as tending to confirm what was previously known, than as throwing any new light upon the subject.

In fact, there is nothing remarkable in the habits of the gorilla, nothing which broadly distinguishes it from the other African apes, nor even from the ourang outang, which also builds a nest, which also assumes the erect posture now and then, and which also charges when wounded or brought to bay.

## THE MOSS-ANIMALS, OR FRESH WATER POLYZOA.

PLATE 5.

BY ALPHEUS HYATT.

(Concluded from page 136.)

Although Fredericella has been more particularly referred to in the preceding Articles, they are, with one exception, almost equally applicable to all of the Phylactolæmata. This exception is the round disc, or lophophore, which in the other four genera changes to a horse shoe shape. (Compare Plate 3, fig. 4, with Plate 4, fig. 1.)

These four have, like the Fredericella, very euphonious names, Plumatella, Pectinatella, Lophopus, and Cristatella; and, while preserving a general identity, vary

extremely in the details of their anatomy and habits of life.

The Plumatellæ abound near the shores of our ponds, close to the surface, and are generally found with Fredericella. Better fitted, however, to endure the sun's rays, they sometimes seek places more exposed to their influence.

One sultry summer day, while searching for Polyzoa under the shelter of a bridge, my attention was drawn to the long water-grasses farther out in the stream, where, to my surprise, I found a specimen of Plumatella Arethusa, its tiny branches and living crystalline flowers glittering in the light as they swayed in the current unprotected from the heat.

The colony is like that of Fredericella, and in some species the unpractised eye would not detect the difference until the horseshoe-like discs were discovered. In others, however, such as Plumatella vitrea, the outer envelope remains gelatinous and transparent in the adult as in the young, and the tubes, or polypides, are in groups of two and more, counting sometimes twenty plumes.

The colony is dendritic, but the branches are always creepers along the surface, and there are no constrictions between the polypides, the branch being merely an elongated, undivided sac. It approximates, in this respect, to the next genus, Lophopus, and would belong to it, but that the statoblast has the plain, oval annulus of its compatriots among the Plumatellæ, which ranks it with them.

Lophopus has, also, lobiform branches, but they are supported in an erect posture by the ectocyst, a lump of clear jelly in which they are buried. The whole colony is very minute, the polypides are all gathered at the ends of the branches, and no longer occupy separate cells as in

Fredericella and most of the Plumatellæ. In the United States, Lophopus is very rare, only one specimen having been found in the Schuylkill River, near Philadelphia. In England, it is abundant upon the stems of floating duck-weed (*Lemna*) and other fresh-water plants.

My first introduction to Pectinatella and Cristatella took place some years since at Pennissewasse Pond, in Maine, one of the smallest of the liquid gems adorning that State.

Induced by the representations of a scientific friend, I visited the pond late in September, and its unexpected treasures kept me a willing loiterer for several succeeding weeks. The season was charming, full of haze and color, with an occasional leaf drifting through the still air, to remind one that the funeral cortege of the summer was passing down the year. Our way to the pond led us through a tortuous, shallow channel, studded with the blackened trunks of trees, the remains of a grove that had once overshadowed the spot where we now floated. I learned that earlier in the season this channel was much deeper, wholly submerging the shattered stumps, which were covered by luxuriant growths of Pectinatellæ, hanging over them like ivy over ruined towers. At this season, however, they were bare, the Polyzoa having sought the cooler depths of the pond.

Passing under a picturesque bridge, we entered the main lake, a long expanse with undulating shores, more like a river than a lake. One could readily imagine it winding on to the distant hills, closing the view to the northward, and the old logs which here and there lifted their sun-baked heads above the autumnal-tinted waters, half reclining with the current, added another river-like feature to the scene. We selected the oldest of these as most likely to furnish us with the objects of our search.

It was firmly imbedded, but when we finally succeeded in bringing the under side in view, the rich harvest of specimens amply rewarded our labors.

No marine or fresh-water animals of our northern climate excel the Pectinatellæ in beauty, or equal them in the tropical profusion with which they grow. The clusters, some as large as our heads, others broad and flat, were covered by hexagonal figures about an inch in diameter, traced by the plumed tubes of thousands of Polyzoa. Each hexagonal pattern, and there were hundreds in some settlements, was a separate colony. The deep, amber-color of the gelatine beneath shone through their central spaces, and each thread of the dense fringe surrounding them was stained with a tiny scarlet dot, the mouth of a polypide; the outline of one of these is given in Plate 4.

The cause of so many being assembled on one common deposit of jelly, is not the least curious fact in the history of the genus. A minute examination proves that a colony of Pectinatella is little more than a hollow case, distended by the fluids within, which prevent the soft walls from collapsing, and support the polypides protruding from the upper side in radiating lines. When this hollow case, or cœnœcium, attains the length of an inch, or an inch and a half, a crease shows itself as if a cord had been drawn tightly about the soft walls. This, deepening, finally cuts the colony into two smaller ones, and these, as they grow, divide into four, which in turn divide into sixteen, and so on. Where this increase is very rapid, the interior colonies are forced to expand upward, and, adding to the gelatine as they rise, build up, in some instances, clusters several feet in diameter, and eight or more inches in thickness.

Side by side with these, occurred thin patches of gelatine covered with what at first appeared a different species of Pectinatella. The central spaces of the colonies, however, were long and narrow, and much less brilliant, being surrounded by tawny-colored fringes of Polyzoa. This genus discards even the remnant of a branch which we mentioned in the lobes of the Pectinatella, and is a hollow sac flattened into a disc below, by which the whole colony move upon the gelatine or ectocyst as one animal.

In Fredericella, the hard, parchment-like condition of the ectocyst was owing wholly to the age of the colony; in the young, it was gelatinous.

We have seen, also, that Lophopus was buried in its own ectocyst, which remained gelatinous throughout life, and that the Pectinatellæ, though firmly attached, simply rested on theirs. And we now see Cristatella making the last step in this process, becoming entirely independent of its ectocyst, which is only a transient secretion thrown off from the creeping disc, like slime from the foot of a snail, to smooth the path over which it crawls. In large settlements the colonies lie closely together, but it is not infrequent to meet with a stray one wandering by itself. Locomotion is accomplished by a complete net-work of muscles within the sac. These, with perhaps other muscles in the walls, enable them to expand the disc in any direction, and then secreting gelatine, and holding to what they have thus gained, draw up their remaining portions. They move so slowly, however, that minute colonies require a day to get over an inch on the side of a smooth glass dish, the larger colonies progressing even more sluggishly. In Plate 5, the outline of a single polypide is given, with a portion of the net-work of internal muscles.

Cristatella is no exception in the animal kingdom; there are many instances in which compound animals move and act in unity. But here there is some hope of solving this mysterious diversity of number, with unity of will and purpose.

The nervous system, wherever it is present, whether in the distinct form of brain, nerve-mass, or ganglion, is essentially the medium of sensation and of motive power.

Now if the nervous system among the Polyzoa is a compound system, having a common trunk with branches leading off into each Polyzoön, a sensation in the main body could be conveyed to each individual, and thus the will of every minute tube be brought into harmony with all, causing the whole to move like one creature.

Fritz Müller, a German naturalist, has actually ascertained that in one of the marine species of Seriolaria, the nerves followed up the hollow trunk and branches of the colony like the dark wood in the heart of a tree, supplying each animal with a nerve. He noticed that if the trunk of the colony was irritated, that all the Polyzoa withdrew their plumes as if alarmed, and this led him to investigations, which resulted in such important discoveries.

Whether all the polypides in a colony of Cristatella unanimously resolve to move, or whether the majority rule and drag the minority at will, or whether again the desire to move is excited in the central nerve-trunk by external causes, has not yet been determined.

One thing, however, seems probable, that the unanimity of action in the little republic is due to the union of the various individualized nervules into branches, and finally into one grand trunk, otherwise parts of the movable sac might be travelling in opposite directions at the

same time, from the sides as well as from the ends, and the colony be broad and sedentary, instead of long, narrow, and progressive.

EXPLANATION OF PLATE 5. *Cristatella ophidioidea* Hyatt.

Fig. 1. Magnified view of one Polypide, isolated, showing at E (above) the upper surface of the sac, or cœnœcium, and at E (below) the creeping disc, and at Q, Q, the meshes of the internal muscles, which aid in locomotion. M, M′, M″, muscles which retract the tube and plume, retractors. N, muscles which retain the fold, which is reduced in this genus to a circular constriction, and devoid of the muscles marked N′, in preceding plates. Z, clear spaces in the wall of the arm. O, the bases of muscles which move the tentacles; the upper portions of these are seen in Fig. 7.

Figs. 2, 3, and 4. Upper and lower side, and profile view of the statoblast. W′, horny sheath; W″, annular sheath; W‴, spines, only eight and five pairs of these are figured, there are in nature twenty-two short and thirty-two long spines.

Fig. 5. View of intestine with upper part of stomach and lower part of throat in the background. K, throat; K′, stomach; K″, intestine; K̄, anus.

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# THE LAND SNAILS OF NEW ENGLAND.

BY EDWARD S. MORSE.

(Continued from page 151.)

HELIX HORTENSIS *Muller*. (Fig. 16.) Shell nearly globular, smooth, shining, yellow. Whorls five, convex, spire somewhat elevated, suture at extremity of last whorl curved toward the aperture. Lip slightly reflected, white, and having a thickened margin within the shell; the reflected condition of the lip disappearing at the base of the shell. Aperture rounded; umbilicus absent. The base of the shell is quite convex. Specimens are sometimes found with one or more brown bands revolving with the whorls. Animal blackish, tinged with brown; creeping disc inky; extremity dirty flesh-color.

Fig. 16.


HYATT ON THE MOSS ANIMALS.

This species has been found in the greatest abundance on certain islands on the coast of Maine, and also on the lower parts of Cape Cod and Cape Ann, as well as in Canada and Nova Scotia. It is unquestionably identical with the European species, and is supposed to have found its way to this country through commercial intercourse, though it seems strange that, while in the old country it is found near the habitations of men, in this country it occurs only upon the most uninhabitable islands.

In England, this species is very abundant, and forms a favorite food for the thrushes and blackbirds. Ralph Tate, the author of a very readable book on the land and fresh-water mollusks of Great Britain, says: "In a country walk one may frequently see a large stone surrounded by fractured snail-shells; these are the slaughtering-blocks whereon the poor snail is sacrificed for the welfare of our songsters and their young progenies. The shells are very systematically broken. The bird strikes the shell upon the stone in such a position as to expose the principal mass of the snail at about the commencement of the last whorl." In France, this species is used as an article of food.

HELIX ALTERNATA *Say*. (Figs. 17, 18.) Shell flattened, heavily striated; light horn-color, with dark brown bands and spots arranged obliquely across the whorls. Aperture, when viewed from below, nearly circular. Lip simple and sharp. Whorls six in full-grown shells. In young specimens the shell is carinated, that is, the outer whorl is keeled or angulated, instead of rounded. The base of the shell is lighter in color than the upper surface. Colorless shells are sometimes found. Diameter about one inch.

Figs. 17, 18.

This is one of the most common species of snail in New England, though occurring only in certain localities; it generally occurs in great numbers. It is found in forests, and sometimes in open fields in damp situations. On islands they often occur in the greatest profusion. When in captivity, they lie buried most of the time under the moist earth, and appear to suffer more from the want of moisture than other species. — *To be continued.*

## PARASITIC PLANTS.

BY G. D. PHIPPEN.

Fig. 1.

To persons familiar with the principles of cultivation, and with more or less knowledge of our native plants, the fact that there are tribes of plants in other regions of the earth, that, without any attachment whatever to the soil, grow and produce flowers of the most novel form and brilliancy of colors, seems wonderful in the extreme. Such are the Epiphytes, or air-plants of the tropics, whose seeds, lodging on the branches of living or decayed trees, or even upon the very rocks, readily vegetate, and draw from the surrounding atmosphere the constituents of their growth.

This is accomplished chiefly through their roots, as in

other plants; and as they are found to increase with much greater luxuriance in the recesses of the forest, by the banks of streams, in a sultry, humid atmosphere, we see less difficulty in comprehending the possibilities of their growth and the economy of their being; indeed, their nature is now so well understood, that they are cultivated with ease in our conservatories.

We do not, however, intend to write of air-plants, as our country produces none; but we have, among our native plants, those whose methods of growth are perhaps scarcely less novel and wonderful; such as our parasites, which derive their nourishment from other living plants to which they adhere,—depending upon the leaves and roots of such plants for the necessary contact with the atmosphere and the soil.

The name Parasite is of great significance, for such plants are robbers in the fullest sense, and live solely at the expense of their neighbors.

The most marked example in this region of such anomalous plants is the Dodder. Our species, the Cuscuta Gronovii (*C. umbrosa* Torrey, or *C. vulgivaga* Englemann) is as strongly marked, and more widely distributed than either of the other American species.

The genus Cuscuta has generally been appended to the Convolvulaceæ, or the Convolvulus tribe, which consists chiefly of twining plants, and have regular monopetalous pentandrous corollas, and two to four-celled capsules, with large seeds. This order is well represented by the Cypress vine and the Morning-glory.

The Cuscutas have no leaves, for these plants need none; all the necessary functions of leaves, as has been stated, being performed by the leaves of other plants on which they grow. They have, however, a few minute

scales in alternate succession, which are in place of leaves, and from their axils spring the branches. (See Fig. 1.) Although so anomalous as these plants are supposed to be, yet the right of being perfect plants must be conceded them, and they are properly assigned a place with other Convolvuli.

Eight or nine species grow freely in this country, two of which are found in New England.

*C. epilinum*, or the Flax Dodder of the old world, mentioned by Gerard and more ancient writers, is naturalized here to some extent. It is said to grow only upon flax, to which it is a great pest, spoiling large quantities. It was noticed by Dr. Cutler as being destructive in his time; but as that useful plant is now seldom cultivated in this region, the Flax Dodder is but rarely detected. A monograph of the American species, prepared by Dr. George Englemann, of St. Louis, can be found in Silliman's Journal, vols. 43, p. 333, and 45, p. 73.

Under the name *C. Americana*, the various native species were for a long time confounded. The botanical text-books tell us that the seeds of this strange plant germinate in the earth in the ordinary manner, throwing downward a root into the soil, by which for a short time the tender plantlet is sustained, until it elongates its thread-like stem sufficiently to reach some foster-plant, around which it immediately twines, and into whose tender bark it thrusts aerial roots, which feed upon its juices; after which, no longer needing attachment to the soil, the primitive root withers away.

After many times plucking the cord-like stems of this plant, and noticing the decisive development of its flowers and seed (for they are as perfect as upon leaf-clad plants), we resolved to prove, with our own

eyes, its double nature and singular method of growth. Accordingly we procured some perfect seed of which the wild plant produces an abundance, and of a size by no means diminutive, and planted them in a bed with other seeds, in small rows, each appropriately tallied, and all designed for transplanting, in due time, to suitable places in the border. In a very few days after planting, the Cuscuta-seed uncoiled its feeble embryo, and erected its simple yellow thread into the sunshine and air; but while we waited for further developments, the spring winds and the warm suns of noon quickly withered them away.

Thus our first attempt at cultivation utterly failed, and solely for the want of some older plants in sufficient proximity for the young seedlings to cling to, but which at the time escaped our reflection. Months elapsed before the experiment was again tried, which was done within doors and in mid-winter with perfect success. The seed readily germinated as before, and when the young plants were about an inch in height, they were taken separately from the earth, and placed here and there on the axils of the leaves of plants near at hand, such as Fuschias, Geraniums, and sundry hanging plants.

With the instincts of their nature (if it be pardonable to use that term), they in a few days attached themselves to these plants, particularly to the Fuschias; and as the spring advanced, they grew with great luxuriance and flowered freely, but, as might be supposed, to the manifest detriment of the plants about which they twined. This, however, was overlooked in the satisfaction arising from success; for had their yellow stems been gold, and their clusters of flowers pearls, the satisfaction would hardly have been greater. Those placed on the hanging plants, although they adhered, made but feeble growth.

One seedling placed upon a plant of *Dielytra spectabilis* did not twine or extend itself with much freedom, but, taking a turn or two near the extremity of one of the branches, it there expended its strength in perfecting a large conglomerate cluster of one hundred or more bells of unusual size and purity of color. In the process of transplanting from the earth to their aerial abode, we at first attempted to convey a ball of earth with each seedling, but this was soon found to be worse than useless.

*C. Gronovii*, the species under consideration, is found in low damp places, and by the side of brooks and ponds, twining and climbing over such plants as the Willow and Cephalanthus, Decodon and Lythrum, Solidago and Impatiens, to which it attaches itself by "tuberculous processes" or "radicating papillæ," as its roots or suckers, under the partial knowledge of their nature, have hitherto been called. This plant grows often to the length of five or six feet, with its branching, leafless stems, considerably resembling tangled cord, and are of a deep yellow or orange color, being thickly studded with cymose clusters of small white bell-shaped flowers, somewhat like those of the Lily of the Valley, but much more diminutive. We have seen this plant growing on the banks of Ipswich River and its brooklets, in great luxuriance, stretching far over the water upon the deeply-immersed stems of the Button-bush and Decodon.

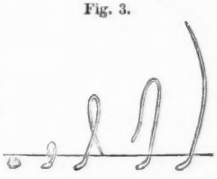
Fig. 2.

This species of Cuscuta does not appear to have any partiality to particular species of foster-plants, but freely attaches itself to such as grow within its reach (Fig. 2). Its flowers, or little globose bells, consist of short five-lobed tubes, with calices similarly divided, and five

stamens inserted between the lobes of the corolla, upon peculiar scaly fringes, not visible in the drawing, which are an expansion of the filaments of the stamens.

The seed contains a filiform embryo, without cotyledons, lying spirally coiled in fleshy albumen, and is distinctly discernible while the seed is in a green state; and here we see written, in the spiral form of the dormant embryo, a prediction of the character of the future plant. In the process of germination this embryo simply uncoils itself; one end as a radicle strikes downward into the soil, while the other, as a plumule, rises from the earth, first breaking ground in the form of a loop, then when the point becomes disengaged resembling a fish-hook, and finally appearing quite straight in its effort to reach some friendly support (Fig. 3).

Fig. 3.



It is generally represented in plates as rising in a spiral form, as also are the branches of the older plants, but this form is not manifest while the unsupported thread is stretching upward for succor, as if attracted by some neighboring object; it is only when the stem is obstructed, or when it reaches the coveted prop, that the spiral form is assumed, and then it becomes very quickly apparent. This is probably true of all twining plants. We have seen the tendril of a squash vine rolled into a perfect ball, when beat by the wind against a stone-wall, the irregularity of whose surface it in vain tried to grasp; while others upon the same plant, not meeting with obstruction, were nearly straight.

The radicle, which is club-shaped, is often turned up in form like a boot; it never increases in size, or ramifies in the ground, but is sufficiently absorbant to keep the

young plant alive for some time, but not enough so to add materially to its primitive development. If at this time a young plant be pulled from the earth, and laid upon its surface, or placed upon some other plant, it will live many days without attachment; and here we see a wise provision of nature, adapted to the peculiar circumstances in the infancy of the plant.

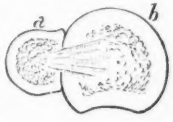
Generally, on the fourth or fifth day after the feeble seedling has been placed upon its guardian branch, it will make one turn around the stem, and the tubercles will immediately appear on the inner side of the twining part, and, after a few more days have passed, the work of absorption will commence. These tubercles, as they grow quite near together along the stem, bear a superficial resemblance to the feet of caterpillars. (See Fig. 1.) Under the microscope each one, in its early stages of development, appears to be composed of a circle of smaller prominences, which finally unite in forming one root or sucker. As the plant continues to twine, these papillæ rapidly multiply wherever the stem closely touches other living tissue, and they are found to unite readily even on other parts of its own stem; they often incipiently form along the inner side of the vine, when at a considerable distance from contact. After passing many of these papillæ under the microscope, we at last detected the manner of attachment and the character of the union.

From the depression in the centre of the above-described circle of swollen cells, a very manifest horn-like process protrudes, and inserts itself into the tissues of the foster plant, and rapidly unites with it (Fig. 4). Where the supporting stem is succulent, this root plunges far beyond the cuticle, even into the very pith of the

Fig. 4.

plant, and soon forms a perfect graft (Fig. 5). The cells of the parasite can be traced deeply imbedded, until lost at the margin, among the cells of the guardian plant, which is thenceforth compelled to support the vine to fruition,—expanding its flowers, and perfecting its numerous progeny of seeds. Though these aerial roots (which are the only true roots the plant has), are thus seen to penetrate to a considerable depth, their union is of such a character, and the absorption and assimilation of the two classes of cells so gradual and complete, that no manifest swelling of the tissues of either plant in contact is visible.

Fig. 5.




When grown within doors, the plant is somewhat green, and does not take on that deep orange color, so general in its native state.

Such are a few observations that this humble plant has afforded. It merits farther investigation, and, in the economy of its nature, is as worthy an object of study as the venerated oak, or the tree that yields us fruit.

Among our wild plants are to be found many others of a parasitic nature. With but a passing allusion to the lichens, fungi, and mosses, many of which grow by attachment to other plants, and are more or less Epiphytic in character, we proceed to notice a peculiar tribe of abnormal plants, that however much they may resemble fungi in certain aspects of their being, yet, as they have flowers and fruit conformable to those of the highest organization, will ever maintain a place among true phænogamous plants, such as Beech Drops,—Epiphegus, and different species of Orobanche,—whose seed are said to germinate only in contact with the roots of beech, or other favorite of the particular species. In the subdued

light of the forest, these verdureless plants elevate their brown and yellow stems, covered with scales instead of leaves, but having perfect flowers.

The Monotropa,—Indian pipe or Pine-sap,—more fungus-like still, holds a rightful place among the Pyrolaceæ, or Heaths, and with its clusters of white or tawny stems, each crowned with a large distinct flower, grows from the decayed roots and leaves of the oak and pine.

It has also been found that sundry leaf-bearing genera, situated at no great remove from the Orobanchæ are more or less parasitic upon the roots of other plants; and it is probably from this cause that the Castilleja, or painted cup, the Gerardias, and Pedicularis are so difficult, or so nearly impossible to cultivate. We have often transplanted them from their native wilds to the garden, and have as often met with disappointment. An English species of Comandra, similar to our Thesium umbellatum, whose fascicles of flowers remind one of diminutive bunches of white lilacs, is also said to form parasitic attachments upon the roots of trees.

## OYSTER CULTURE.

BY F. W. FELLOWES.

Beyond dispute or question, the French government has taken the lead of all the world in the scientific propagation and skilful culture of the oyster. For the past six years, the great discovery by the distinguished French savan, Professor Coste, of the mode of reproduction of this mollusk, has been converted to practical use; and in suitable localities on the western coast of France, imperial farms, or *parcs*, as they are called, have already

been put into successful operation. Many hundred million of these delicious bivalves (they are sold in France by the hundred, or count, and not by the bushel as with us) now flourish and fatten in shallow bays and basins, where, a few years since, not a solitary specimen could be taken, owing to the thoughtless and improvident industry of the fishermen, who captured and sold every oyster they could find, regardless of season, size, or condition. As a natural consequence the native growth was exterminated, and it seemed probable that a source of profitable labor was gone forever from a very considerable number of the fishing class on the seaboard, who, in overpopulated France, could ill afford to lose one chance of earning their few sous a day; while, on the other hand, the tables of the rich were likely to be deprived of one of their favorite and most esteemed luxuries.

Just at this time, in 1858–9, Professor Coste settled a long-mooted point in natural history, namely, that the oyster—in common with many of the lower order of acephalous animals—is hermaphrodite, combining both sexes in the same individual, and his theory of its generation is substantially as follows:—

Possibly the second year, but certainly the third year, the oyster reproduces its kind. During the summer, at seasons varying with locality and temperature from April to July, many hundred thousand ova are simultaneously produced in *capsules* provided for them; these ova are fecundated at an early period of their growth, long before their increase of size and weight causes them to burst the ovarian capsules, and commence their existence in the milky fluid which is prepared for them at this time. The ova are especially enveloped and protected by the branchial folds of the

mother oyster. By an admirable provision of nature, this milky fluid now begins to dry up and thicken, forming a paste which deposits upon the ova exactly what is necessary to form a delicate shell in a few hours, when brought into contact with the salt water by expulsion from the shell of the parent oyster. No sooner is one brood thus sent out into the world of waters to shift for itself, than this process is immediately repeated, and it is known that an adult oyster produces between two and three million of young during a season.

Although the oyster is so remarkably prolific, the "spat" or "spawn" has so many enemies who feast upon it, and there are so many chances against its safely finishing the second year,—when it is tolerably safe,—that an average of less than one-tenth is permitted to attain a merchantable size.

The spawn does not escape of its own accord from the mother oyster, but is expelled (*lancé*) with considerable force, forming at first a grayish cloud which soon disperses and disappears by motion of the water and by individual action, as each young oyster—gifted with slight filial affection—seems eager to remove as far as possible from its parent and the place of its birth, and fearlessly swims away, henceforward to take care of itself and find its own means of existence. These independent little ones are provided with a special locomotive apparatus,—which is at the same time an organ of respiration, and perhaps of hearing and of vision,—by means of which they disperse themselves at the proper time in search of some hard and solid body like a stone, a branch, or a shell to which they can attach themselves and "settle down" for life.

"Nothing is more curious and more interesting," says

M. Davaine in his "*Recherches sur la génération des huîtres*," than to see, under the microscope, these little molusks travel round the portion of a drop of water, which contains them in vast numbers, mutually avoiding one another, crossing each other's track in every direction with a wonderful rapidity, never touching and never meeting."

This curious motive power consists of a great number of hair-like filaments, called *cilia*, which take their rise in a dark-colored fleshy mass that emerges from, and overlaps the valves of the oyster on the edge opposite to, and farthest from the hinge, and operated by powerful muscles, can be at pleasure drawn entirely within the valves.

If the young wanderer meets with any hard substance, it clings to it, and in a few hours—as it is at this time rapidly making its shell—a calcareous deposit fixes it there, and, in due course of time, the cilia drop off. But even if no such suitable object presents itself, these wanderings must certainly soon come to an end.

The base of the locomotive apparatus gradually narrows, this organ becomes more and more prominent, until it is only attached by a single slender membrane to the oyster,—which still continues to travel with it,—when, at last, it entirely detaches itself from the oyster, which at once sinks, incapable of farther motion, while the cilia keep on swimming; but, like a vessel without a helm or pilot, their motion is undirected, they roll over and over on themselves, colliding with everything in their course, and, though they can hardly be said to die, soon cease to move.

As soon as the cilia are removed, the oyster commences life in earnest: lips to seize its food, and a stomach to digest it, are developed; *branchiæ*, or respiratory

organs appear; the heart reveals itself and begins to beat; all the functions necessary for existence are set in motion in good working order; and if fortunately placed for obtaining infusorial and vegetable nourishment, in three or four years this embryo "Cove" or "Millpond" or "Shrewsbury" will become a delicate mouthful for the consumer.

Though there are many other enemies of the modest and inoffensive oyster, there are three which are specially feared, and cause the greatest loss to the planter in American waters, namely, the "Starfish" (*Asterias arenicola* Stimpson), the "Drill" (*Buccinum plicosum* Gould), and the "Winkles" (*Pyrula canaliculata* and *P. carica*).

All are familiar with the appearance of the Starfish, though few, even of old oystermen accustomed to annual losses from this five-fingered pest, are acquainted with the manner in which it is so destructive. Even writers upon the oyster, whose general information upon this subject should have taught them better, have fallen into the same error of supposing that the taper fingers are introduced between the valves, and, in some mysterious manner, kill and devour the contents.

The Starfish is provided with an extensible mouth, situated in the middle of the underside, and can only injure an oyster of a certain size relative to its own. If the oyster is small enough, it is swallowed shell and all; the body is digested, and the shell ejected. But if its victim is a little too large for this operation, Nature has provided this scourge with the power to turn its stomach inside out, envelope the unhappy oyster, and absorb the dainty flesh within by means of gastric juice. A. Agassiz, in "Seaside Studies," speaks of this peculiarity as follows: "These animals have a singular mode of eating; they

place themselves over whatever they mean to feed upon, as a cockle-shell, for instance, the back gradually rising as they arch themselves above it; they then turn the digestive sac, or stomach, inside out, so as to enclose their prey completely, and proceed leisurely to suck out the animal from its shell."

When nothing more within the shell remains to be eaten, the stomach is turned back again, and, gifted with a constant and insatiable appetite, the Starfish is ready to recommence its filthy feeding upon the first oyster within its reach. The countless suckers on the underside of this animal are used only for locomotion, just as the fly walks upon the ceiling by means of a similar contrivance on the feet. The general belief that the Starfish takes its nourishment in some mysterious way by means of these suckers is consequently an erroneous one, as they have no openings at the ends, and do not connect in any way with the stomach.

The Drill is a troublesome and destructive intruder upon the oyster-bed, the more so that, from its small size and rapid multiplication, it is difficult to eradicate from a locality when it has once colonized in force. Whole beds are sometimes taken up and transplanted, to avoid this detestable little thief. A slightly different species of the Drill forms no small item of cheap food for the French peasants. They call it the Bigorneau (*Murex tarentinus*), and, when boiled, the meat is picked out with a large needle. Its flavor is excellent, though it is repulsive in appearance, being of a dark green color, and having a decided spiral tail, which renders it anything but inviting to a person about to eat it for the first time.

The Drill has a dark, ridgy, conical shell, about an inch long, and by the help of a broad, flat, fleshy foot, with

which it is provided, fixes itself exactly over what is commonly called the eye of the oyster, and by means of a rough file-like tongue, which it moves forward and back, over the chosen spot, soon drills a round hole through the shell, and sucks out the life and juices of the oyster at its leisure.

The Winkles are a much larger species of the same tribe, and destroy the oyster in a similar manner, only not being so numerous, they cause less damage, and are not so much dreaded by the oyster planter as the little Drill.

The oysters to be found on the *carte* of any good restaurant in Paris are,—the common oyster, price fifteen cents per dozen; the Ostend, price thirty-five cents per dozen; the Marennes, or green, price thirty-five cents per dozen; and the Imperial, price forty cents per dozen.

Each variety has a peculiarity, and its special admirers. The last three, during the winter months, are fat and full-flavored, though small; the Ostend and Imperial being English born, but cultivated and manipulated in France. The French oyster-shell is more round and flat than our own, the body lying in a sudden deep depression close up to the hinge, while a considerable space of the interior of the shell is unoccupied by anything except the mantle. A dozen of either of the last three varieties is a better appetizer to commence a dinner with, than any kind known in this country; while for cooking in every form, the much larger size of the American oyster renders it by far superior.

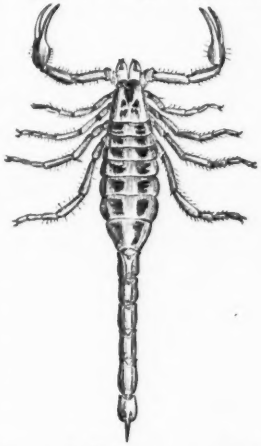
The French lay great stress upon having the shell of this oyster extremely clean (*bien nettoyé*). A gentleman at Marennes, who cultivates the green oyster, has recently erected a tide-mill—for which he has a patent—for the

double purpose of smoothing the roughness and perfectly cleansing the outside, and of wearing off enough weight of shell by *trituration* to save a dollar freight on the railway carriage to Paris, of a *panier* containing a thousand.

## SCORPION OF TEXAS.

BY G. LINCECUM, M. D.

THE scorpions of Middle Texas, so far as I have investigated the subject, do not extend beyond a single species. There may be others, but I have not observed them. The species we have is viviparous, carrying its young, eight in number, on its back, until they are three-fourths of an inch in length. When first seen, clinging on the back of the mother scorpion, they are so small that it requires a microscope to examine them satisfactorily. They are white, and look as if they were very tender. They cling tenaciously, and when by violence they are separated from the mother, she shows manifest signs of distress, running about till she comes in contact with the lost ones, when they immediately climb up and cling again closer than before. At this early period, they seem already to be well versed in scorpion tactics, wielding their nimble tail, and its recurved weapon, with dexterity and swiftness.



Scorpions pass the winter in close quarters, and gen-

erally in a torpid state. They are seen early in warm weather coming out at nights, and sometimes during warm damp periods in winter. They are altogether nocturnal in their habits, and are carnivorous, subsisting on insects of various kinds, and even small lizards. As a speciality, they prey largely on crickets. They dwell under old logs, rocks, in old stumps, under the bark of dead trees, under old fences, between the shingles on house-tops, and particularly about the jambs and hearths of fire-places. In temper they are hasty, and will employ their weapons on slight occasions. The pain occasioned by their venom, when injected into one's flesh, is very quickly felt, and quite severe, giving the idea of a burning-hot fluid thrown into the system. It does not last long, nor does it swell much, and is not so painful, nor does it produce so much inconvenience as the sting of the honey-bee. In countries where they abound, people do not regard them with much terror. Chickens are very fond of them, and voraciously devour every one they can find.

I once found a mocking-bird (*Mimus polyglottus*) which by some awkward stroke in his rapid flight, had fractured his right wing. It was running on the ground, and had become quite hungry and light. After dressing and securing the little songster's wing, I turned over some old rails in search of something for him to eat. There were plenty of crickets and scorpions concealed under the rails, for the latter of which he showed the greatest preference. He would peck at them, and by bruising and thus stunning them a little, readily swallow them whole. After he had swallowed seven of them, I thought, as I had volunteered my services as surgeon and physician for him, it would not be prudent for me to suffer him to in-

dulge farther at this time; so I placed him in a large cage with some canary birds, where he remained feasting on nine scorpions a day, until he had recovered the use of his wing, when I set him free.

Scorpions are generally found two or three together, sometimes in larger numbers. They shed their skins without a rent, coming out at the mouth, like the snakes. They moult when they are about half-grown, and again when they come to maturity, and I do not know that they ever again cast their skin during the remainder of their life. They live through two winters, as I can testify, and may exist many years. They are not possessed of much intelligence, making no nests or preparation for winter, beyond crawling under rocks and other dry and sheltered places. Their principal cerebral developments are amativeness, alimentiveness, and cautiousness.

## A NOTE FROM THE FAR NORTH.

BY J. T. ROTHROCK.

Early in the year 1865, the writer of this scrap eagerly embraced an opportunity afforded him of visiting the less known parts of North-western North America. The region travelled over lay between the Coast Range and the Rocky Mountains, and from latitude 50° north to 61° north.

From latitude 56°, as far north as Fort Youkon (a post belonging to the Hudson Bay Company, exact position undetermined), a distance of at least 1,500 miles, the country was, and still is, in part, a *terra incognita*. It is to be hoped that erelong much of the uncertainty hanging over it will have been cleared up. Geographers, it is

true, did manage to fill up the blank in a wonderfully inaccurate way, just as they used to—

> "In Afric's maps
> With savage pictures fill the gaps,
> And o'er uninhabitable downs,
> Place elephants for want of towns."

Even of the upper waters of the Fraser, Nasse, or Skena Rivers, no trustworthy chart existed. Much less could we expect those of the Pelly or Liard to be accurate.

At Fort St. James, on Stuart's Lake, latitute 54° 44′, longitude (approximate) 124° 48′, the unknown country may be said to begin. Here for the first time we notice the outlying peaks of another set of mountains, which completely fill the valley (a degree farther north) between the Coast Range and the Rocky Mountains.

These mountains, though known by name to geographers, have always had their altitude underestimated. Near Stuart's Lake they are as high as three thousand feet above the general level of the lakes. At Lake Tatleh they rise to five thousand feet. At Bear Lake, about latitude 56° 15′ N., they are from six thousand to eight thousand, and near Lake Toutah they rise often as high as ten thousand feet. These altitudes are only given as above the general, or lake levels. Add to them from three thousand to five thousand feet, and it will at once be seen that they attain no mean elevation above the sea level. Perhaps I can give no more just idea of the general features of the country around Lake Toutah, than to state that the land rises into a plateau, about 3,500 feet above the sea level. This plateau, lying between the Coast and Rocky Mountains, is dotted over with peaks of the above-mentioned heights. Sometimes neighboring peaks are joined by their bases; often one finds them completely isolated. Nature seems to have set at defiance all law and order,

and to have been governed only by the wildest caprice in their distribution. No axis can be traced, and it is a physical impossibility to walk for a day in a straight line over the prairie plateau at their base. One may ascend, as a rule, the southern slopes of these peaks readily enough, but the northern slopes almost invariably give you from 1,500 to 2,000 feet of sheer precipice at a single leap. Skirting their bases are found dwarfed balsam trees, whose limbs are festooned with the long gray lichen eaten by the Caribou, or now and again a stray cottonwood may present itself. So thickly are the peaks distributed over the country, that the original plateau is seen only as a narrow and almost treeless valley, winding about between the peaks. Yet by following these valleys one may reach the waters of the Liard without crossing a single mountain.

The storms which sweep through the passes must, at times, be fearful. I remember seeing a tree (the largest one indeed which I noticed at this elevation) full two feet in diameter, that had been twisted off by the wind, and carried two hundred feet away from the stump.

Near the top the peaks are bald, and offer no other inducement to the adventurous botanist than a few lichens. Even the snow will not lie on the summits during the winter months, but is blown away into the valleys below, and into the gulches which streak the declivities. Hence, during the winter, when the valleys are buried beneath twelve or fourteen feet of snow, the Caribou seek the mountain tops to eat the lichens. The valleys are worn out into deep gulches by the melting snow, and everywhere you are met by miniature cañons in crossing them. Even in mid-summer the snow falls to a depth of a foot or more, at times, on the mountain sides. Among

these mountains lies Lake Toutah, a beautiful sheet of water, full sixty miles long. At certain places the mountains come jutting down to the very water's edge, and at others recede so as to allow a beautiful open prairie to stretch along the edge. This lake is the head of Finlay's Branch of Peace River, which in turn empties into McKenzie's River. Yet within less than two hundred yards of its southern end rises a tributary of the Skena River, which empties into the Pacific Ocean in latitude 54° N.

The extremes of temperature are great. September 15th, in latitude 56° N., the thermometer stood at 6 o'clock, A. M., at 15° Far., at 2 o'clock, P. M., at 83° Far. After the avalanches and solar heat have carried off the snow from the mountain sides and valleys, the vegetation again starts up with a rapidity that would astonish even a native of the tropics. Hardly a fortnight elapses after giving up the snowshoes, before one finds the lower and more fertile spots covered with verdure, and blooming as a garden. Among these early flowers we find a Nardosmia, Calypso borealis, several species of Violets, a Polemonium, Valerian, etc. These mountains form an Indian paradise. Secure here from any present or prospective annoyance from the whites, the Siccannee, Nahanni, Koninah, and Kloo-dini tribes hunt the Caribou, Grizzly Bear, Moose, Beaver, and Marten. Perhaps the beavers are nowhere in the world so numerous as among the Peak Mountains. The Indians are, as a rule, friendly, and no man of ordinary courage need to be deterred through fear from going where he lists. To the young, active adventurer, who wishes to make a name for himself as an explorer, no more promising field than the one we have noticed can present itself.

# REVIEWS.

PRODROME OF A WORK ON THE ORNITHOLOGY OF ARIZONA TERRITORY. By *Elliott Coues, M. D., U. S. A.* Philadelphia, 1866. 8vo. pp. 64.

This forerunner of a larger work on the Birds of Arizona contains a list of the birds discovered by the author while stationed at Fort Whipple, with which are enumerated all other species ascertained to inhabit the Territory; together with brief critical and field notes, and descriptions of several new species. We extract several paragraphs showing the great interest attending the study of a new fauna, and the relation of animals to the soil they inhabit:—

"The features, dependent upon latitude, which separate Arizona from adjacent regions, to the north or south, are by no means so marked as those which distinguish it from the countries lying east and west, and mainly consist in the introduction into the lower, warmer parts of the Territory, from Sonora, of several Mexican and subtropical species. A "wedge," so to speak, of these types is pushed a little northward of Mexico, and they are readily recognizable as a somewhat prominent element among the birds of Southern Arizona, and of the Colorado valley for a considerable distance. Perhaps this is more decidedly the case here than at other points on our southern border. A considerable number of species properly belonging to the United States Fauna, and generally distributed throughout Arizona, retire in winter beyond the Sonoran border; while at the same time it is interesting to note that some species breed quite high up in Arizona, or even further north, which are, at the same time, summer residents of the table lands of Mexico. To the northward, neither the climate nor physical geography of Arizona are sufficiently diverse from those of adjacent Territories to produce any special differences in the Avifauna; unless indeed the apparent absence of one family can be substantiated as a marked peculiarity.

"Some facts of physical geography have a marked influence upon the birds. From the dearth of water throughout almost every portion of the Territory there results, as a natural consequence, a great paucity of Grallatorial and Natatorial forms; so much so, that with a few prominent exceptions, a list of the Water Birds of the Territory is little more than an enumeration of those of the Colorado and Gila Rivers. There is also to be noted, as an interesting fact, the effect of the hot, arid, desert wastes of the region of the Gila, and Southern Arizona generally, upon the colors of the species found there. A light, dull, apparently faded condition of plumage, in which some shade of gray is a predominant tint, and all lines and streaks are more or less obsolete in character, is met with in numerous instances, forming true local races or varieties. In other cases the specific characters which distinguish birds of this middle southern province from other closely allied species, partake, in a measure, of this peculiarity.

"In this connection I may advert to an interesting point, which I consider as quite probable, though contrary to the usual laws of migration; viz., that many of the birds of the Colorado valley, which are there winter residents, instead of migrating far to the north in spring, by turning simply to the eastward, find in the region of which Fort Whipple is the southern limit the conditions necessary for breeding grounds."

"The seasons are well pronounced at Fort Whipple, and do not differ notably from those of the Middle Atlantic States. This enables us trenchantly to divide those of its birds which are not permanent residents into summer and winter residents, and migratory species passing through in the spring and autumn. And I have noticed in many instances that the times of arrival and departure of non-residents are strikingly similar to those of the migratory species passing through Washington, D. C. Quite the reverse is

the case in southern Arizona; where the protracted heat and drought of a long summer, which encroaches on intermediate seasons, disturbs the regularity of migration; or even entirely takes away from some species the migratory impulse."

The habits of a genus of woodpeckers are thus described:—

"The genus in question is a xylophagous rather than an insectivorous one. I do not mean that the *Sphyrapici* never eat insects, for coleoptera and their larvæ may often be found in their stomachs. But their main sustenance is the cambium, or soft, inner, *live* bark of trees, the succulent juices of which they appropriate to their economy, rejecting the ligneous, unnutritious fibres in the ordinary method. They are, in fact, true "Sap-suckers," and it is their devastations upon fruit and ornamental trees which have brought the family of woodpeckers into such disrepute among agriculturalists; a class not ordinarily observant enough to discriminate between these birds and the harmless or rather beneficial species of *Picus*, *Melanerpes*, *Centurus*, etc. Instead of simply "tapping" trees, —generally their decayed or dead portions too,—to extract the injurious beetles and their larvæ working within, the Sphyrapicines denude live branches of their bark, often for an area of several square inches at a time. I have before me specimens of wood thus attacked, from which the bark has been removed from large irregularly shaped spaces; and the result, as might be expected, is exceedingly different from that produced from the simple drilling of little holes by the insectivorous genera. Besides the cambium, all the species, particularly in the fall, feed extensively upon ripe fruits and berries of all sorts."

The occurrence of hybrids between closely allied species of animals is now well known sometimes to occur. The author thus speaks of a hybrid between two species of Junco, the Snow-bird:—

"I have thus gone somewhat into detail regarding the characters of *J. oregonus* and *caniceps*, because in my collection are several examples which I regard as most undoubtedly hybrids between the two. Their general aspect is that of *caniceps;* the head, neck, and throat being slate gray, not black; the lores decidedly blackish, etc. There is a large dorsal area, colored as in *oregonus*, and, most marked feature of all, the sides are strongly tinged with pinkish fulvous, exactly as in *oregonus*, instead of being plain cinereous gray, concolorous with the throat, as in *caniceps*. Other specimens preponderate still more towards *oregonus*, in having the head and neck rather slate black than slate gray.

"The specimens are such palpable hybrids, that they need not in the least invalidate the specific distinctions between the two species. In the case of *Colaptes auratus* and *mexicanus*, it has been proven incontrovertibly, that such a thing is entirely possible between closely allied though quite distinct species."

The Wild Turkey was found to be "a permanent resident of the mountains of the immediate vicinity of Whipple, but quite rare, so much so that I procured no specimens. In some portions of the Southern Rocky Mountains region, it is exceedingly numerous."

## NATURAL HISTORY MISCELLANY.

### BOTANY.

THE LOTUS.—All the tribes of the White Nile have their harvest of the Lotus seed. There are two species of water lily—the large white flower, and the small variety. The seed-pod of the white lotus is like an unblown artichoke, containing a number of light-red grains equal in size to mustard-seed, but shaped like those of the poppy, and

similar to them in flavor, being sweet and nutty. The ripe pods are collected and strung upon sharp-pointed reeds about four feet in length. When thus threaded they are formed into large bundles, and carried from the river to the villages, where they are dried in the sun, and stored for use. The seed is ground into flour, and made into a kind of porridge. — *Baker's Albert Nyanza.*

## ZOÖLOGY.

ARTIFICIAL NESTS OF INSECTIVOROUS BIRDS IN SWITZERLAND. — It is evident that the agriculturist must mainly rely on the insectivorous birds to guard against the attacks of injurious insects. The subject has attracted much attention in Europe. For twenty-five years, M. Auguste Burnat has domesticated in artificial nests, numerous species of birds which have effectually stopped the ravages of insects. Such nests, made of various forms and of different materials to suit their occupants, were placed in the trees in gardens, orchards, and in public promenades and parks. The birds most easily raised were the sparrows, etc. (*Fringilla, Sylvia, Certhia*), the nuthatches (*Sitta*), and the woodpeckers, which last are very serviceable, as are the martins and swallows. The starling has been raised in great numbers, being more easily multiplied than any other bird.

"During the years 1852 to 1857, the Inspector-General of Forests, M. Dietrich, at Grunheim, in Saxony, reported that two species of Beetles, the *Hylobius abietis* and *ater* [allied to our Pine Weevils], had ravaged to a great extent the firs of his district. During this time there were spent in destroying these insects over four thousand francs, but in spite of every effort the evil still existed. It was then remedied by the Starlings. The inspector placed one hundred and twenty-one artificial nests in the neighborhood of the plantation of pines (*épiceas*). The success was complete. At the end of May, in examining some young Starlings scarcely able to fly, their stomachs were found filled with Weevils, whose "snouts" had been, previously to their being swallowed, broken off by the parent birds. If the Starlings sometime feed on plumbs and grapes, they can be easily frightened off. There are few regions where so much fruit is produced as in the principality of Alenbourg; we may attribute the cause, in part, to the artificial nests established for the Starling. It is the same in Holstein and in Lombardy, where they take the same care in multiplying the Owls." — *Bulletin de la Societe d'Acclimatation.*

We learn that two hundred English Sparrows were last year domesticated in Union Park, in New York city, and that they completely destroyed the Canker-worms infesting the shade trees. Forty pairs have just been imported into New Haven. The English Sparrow also feeds very largely on grain, and may prove troublesome to farmers.

The attention of the Boston Society of Natural History has been called to the thieving propensities of this bird. "At a meeting of this Society, held April 18th, Dr. Charles Pickering called attention to the recent introduction of the House sparrow of Europe into this country. As it threatens great evil, preventive measures should be

speedily adopted. Proofs of its destructive habits were cited from standard authors, showing that the bird had been the acknowledged enemy of mankind for more than five thousand years. When writing was invented the sparrow was selected for the hieroglyphic character signifying *enemy*.

"Sonnini, in the Dictionaire d'Histoire Naturelle, published in 1817, says: —

"'Sparrows are impudent parasites, living only in society with man and dividing with him his grain, his fruit, and his home; they attack the first fruit that ripens, the grain as it approaches maturity, and even that which has been stored in granaries. Some writers have wrongly supposed that the insects destroyed by them compensated for their ravages on grain; eighty-two grains of wheat were counted in the craw of a sparrow shot by the writer, and Rougier de la Bergerie, to whom we owe excellent memoirs on rural economy, estimates that the sparrows of France consume annually ten million bushels of wheat.'

"Jardine says that a price is set on their heads because of their severe depredations on grain and garden seed, and Valmont-Bomare makes a similar statement in his Dictionary.

"That their destructive propensities were popularly known in England is shown by Cowper's lines: —

"'The sparrows peep and quit the sheltering eaves
To seize the fair occasion; well they eye
The scattered grain, and thievishly resolved
To escape the impending famine: often scared
As oft return, a pert, voracious kind.'"

Our native insectivorous birds, including the Crow and Robin, which have lately fallen into disfavor, should be carefully protected. They undoubtedly save more money to the farmer in eating grubs, worms, and insects, than he loses by their fondness for grains and fruits. If we destroy the balance of nature, and cause a disproportion between the number of insectivorous birds and their insect food, we shall certainly suffer from the increase of obnoxious insects.

## GEOLOGY.

Advance of Geological Science. — In his inaugural address, the President (W. R. Grove) of the British Association stated that most geologists of the present day, instead of holding that the breaks or chasms in the geological record represent sudden changes in the formation of the earth's crust, adopt the alternatives that they arise from dislocations occasioned since the original deposition of strata, or from gradual shifting of the areas of submergence; that the advance of science has more or less filled up the gaps supposed to exist between the characteristics of the extinct and the new species; and that the apparent difficulty of admitting unlimited modification of species would seem to have arisen from the comparison of the extreme ends of the scale, where the intermediate links, or some of them, were wanting.

In these statements the President struck the key-note of the proceedings of the Geological section during the following week. Never, probably, did the authors of papers, or those who took part in the discussions which they elicited, appeal so little to convulsion, cataclysm, or catastrophe. — *Quarterly Journal of Science, London.*

## MICROSCOPY.

The Microscope in Medical Jurisprudence. — In a case of poisoning by means of corrosive sublimate maliciously substituted for the proper medicine, and in which there was a doubt of the utmost importance to remove, as to the source of the poison, rendering it uncertain whether the child had met with its death by accident, carelessness, or otherwise, Mr. Deane, by the aid of the microscope, determined, in the most unequivocal manner, that the poison was derived from a small parcel of the same substance, kept in a piece of rag in the house of the child's parents, where it died, thus rendering it quite certain that the death of the child was premeditated, and at the same time removing every trace of suspicion from innocent parties, whose care and common sense had been called in question. — *Address of the President, James Glaisher, of the Microscopical Society, London.*

The Polycystina. — In a paper on the structure and affinities of the Polycystina [one of which, *Podocyrtis Schomburgkii*, is figured on the left side, at the bottom of the title-page of the Naturalist], Dr. Wallich has furnished us with an elaborate account of this obscure family of the Protozoa, and a classification based, as he believes, on the only constant characters it exhibits, viz., those involved in the mode of development and growth of the silicious framework within, and around which their soft part, or sarcode, is sustained. — *Ib.*

## EXPLORATIONS AND WORKS IN PROGRESS.

The Lyceum of Natural History of Williams College, propose to send out early this summer a scientific expedition to South America. It will be under the charge of Prof. James Orton, of the University of Rochester. The design of the party, to consist of twelve, is to collect specimens of Natural History, and study the physical geology of the Cordilleras, making Quito the base of their operations. Special observations will also be made on the physical geography of the region, particularly the nature and altitude of the volcanic cones.

This active society has already sent out five expeditions; two to Nova Scotia, one to Newfoundland, one to Florida, and one to Labrador and Greenland. Subscriptions to aid the expedition are desired.

Dr. T. M. Brewer is engaged in preparing for the press the second and last part of the *North American Oölogy*, the first part of which appeared in volume seven of the Smithsonian "Contributions." The eggs and nests of about one hundred and fifty birds will be described. The illustrations will consist of about one hundred figures, in five or six 4to plates.

We have received some advance sheets of a work on the *Ornithology and Oölogy of New England*. By Edward A. Samuels. Nichols & Noyes, Boston. We shall give a farther notice of it hereafter. It will contain over five hundred 8vo pages, and be illustrated by twenty-three plates of Birds, four plates of Eggs, and a large number of wood-cuts.

## CORRESPONDENCE.

In answer to several inquiries regarding the disease resulting from eating pork infested by the Trichina, we print the following account kindly prepared for the *Naturalist* by a well-known authority on this subject: —

*Trichina spiralis.* — This entozöon is the cause of a serious and often fatal disease of the intestinal canal and muscular system of man, called Trichiniasis or Trichinosis, which is produced by eating the flesh of swine similarly affected. Before giving an account, however, of the natural history of this parasite, it may be well to state that trichinous pork is not measly pork. Measles in the hog is the encysted stage of the common tape-worm of man (*Tænia solium*). Measly flesh being eaten, the little cysts or scolices, as they are called, which consist of the future head of the mature animal inverted, escape from their sacs within the stomach, unless previously destroyed by cooking, and attach themselves by their armed heads to the intestinal walls. From this head are developed one after another the joints which make up the body of the tape-worm. The first formed or oldest joints, or proglottides, when sexually mature, escape from the intestinal canal of their host, and, being eaten by swine, the ova they contain are set free. During digestion, the eggshells are dissolved, and the minute embryos find their way into the tissues of their new host, to be again converted into encysted scolices, or measly pork. In this stage the tape-worm is called Cysticercus cellulosæ.

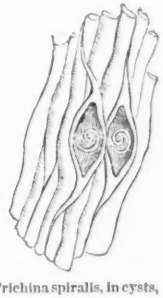
The Trichina spiralis, on the other hand, does not belong to this order of Cestoidea or encysted worms, but to the Nematoidea or round worms (of which the pin-worm is an example), and its development is much less complicated. If trichinous pork is examined by the microscope, the muscular fibres will be found occupied by minute

cysts varying in size, from 1-30th to 1-60th of an inch in length, and 1-100th to 1-150th of an inch in thickness; thirty-five thousand of these have been counted in a single cubic inch of muscle, and it has been estimated that an ounce of such flesh would contain three million cysts. Within them may be seen coiled upon itself, in a spiral form, the young worm, which, when removed by pressure, measures 1-25th of an inch in length, and 1-620th of an inch in diameter. The cysts and young are represented in the accompanying figures. (Fig. 1, the young worm; and Fig. 2, the cysts, after Dalton.) If now such pork is eaten by man, the cysts are dissolved during digestion, and the young worms, unless previously destroyed by cooking, or other process, are set free, to enter the intestinal canal. There they lose their spiral form, increase rapidly in size, and become sexually mature in a few days. Both sexes are at first found in equal numbers, but after impregnation the females alone remain, and by the tenth or fourteenth day the males, which are much the smaller, have all perished. The time required for the development of the embryos is from four to eight days, after which they begin to leave the oviduct in the form of exceedingly small, transparent worms. They may continue to be discharged in immense numbers, however, for six weeks, inasmuch as time is required for the development of the whole number of ova; from three hundred to five hundred in each individual. Immediately after birth the young leave the residence of the adults, the intestinal canal, and give rise to the first symptoms indicative of their presence. They bore into the intestinal walls, and wander along the areolar tissue, penetrating to nearly all parts of the muscular system. Entering the primitive bundles of this tissue, which they devour as they proceed, they increase in size, and finally coil themselves up and remain quiescent. Sooner or later an oval membranous capsule is formed about them, which eventually becomes cretaceous and opaque, and gives to the muscles a white, sanded appearance. The time required for these processes is various. The wandering begins immediately after birth, but it may be several weeks before the whole brood has found its final resting-place. In this qui-

Fig. 1.

Trichina spiralis. Magnified about one hundred times.

Fig. 2.



Trichina spiralis, in cysts, from muscular tissue of Ham. Magnified.

escent stage they may remain alive for many years, and after the death of their host may become mature in turn by entering the intestinal canal of some other host.

The symptoms caused by their presence in man vary according to the number eaten and the stage of development. At first nausea, loss of appetite, and intestinal irritation. Afterwards debility, fever, œdema of the face, movements of limbs painful, and sensitiveness of muscles on pressure. Lastly, great inflammation of intestines with bloody stools, increased muscular pains, partial paralysis of muscles of deglutition, speech, and respiration, and finally death from exhaustion. If only a small quantity of the trichinous pork be eaten, the symptoms will be mild, and in all cases they will disappear when the worms have become quiescent or encysted in the muscular tissue.

The history of the trichina is interesting, and may be briefly told as follows. Many years ago it was found in the muscles of man after death, and described by Owen. Subsequently Leidy found it, also encysted, in the flesh of the hog, and since then it has often been noticed in dissecting-room subjects, giving a sanded aspect to the red muscular tissue. It was always considered harmless, however, and in 1855 Küchenmeister published a theory that it was only the immature form of Trichocephalus dispar, a minute thread-like intestinal worm. Experiments conducted by Virchow and Leuckart, however, in 1859, by feeding animals with trichinous flesh, demonstrated the error of this opinion, and also the important facts that the encysted trichinæ were set free in the intestinal canal, there to become mature; that living embryos were developed within them, which escaped to wander in the muscular tissues of the same host, or might be transferred with the intestinal contents to another animal to become in turn the encysted form; and that the cysts were formed within and consisted of the thickened sarcolemma of the primitive muscular fibres, not, as had been supposed by some observers, within the capillary tubes.

These results pointed unmistakably to the manner in which man also became infected, but they were still considered of no pathological consequence until early in 1860, when a servant girl died in the hospital at Dresden, after a month's sickness, with symptoms like those above mentioned, and on examination after death Zenker found the muscular system filled with free and moving trichinæ. He concluded that it was a case of fresh infection, and that the worms had been the cause of her death. A microscopic examination of the contents of the intestine revealed the presence of numerous mature trichinæ of both sexes, the females still containing living embryos. Portions of the muscular tissue of the girl were sent to Virchow and

others interested in the subject. The former administered it to a rabbit, which was killed by the wandering of the young brood set free within its intestine; the others, as well as Zenker, fed dogs with the same, but the results corresponded with those previously and subsequently obtained, viz., that trichina undergoes only a partial development within their intestinal canal, does not long remain there, and does not wander into their muscular system. It remained to be ascertained where the girl obtained the trichinæ which caused her death. She was taken sick after Christmas in the country where it was the custom to kill swine for the feast of the season, and Zenker, knowing the frequent occurrence of trichinæ in these animals, concluded that some connection would be found between the disease and the meat. On visiting the place, he found that the farmer with whom she had lived had killed a hog on December 31st, and that the ham and sausages, which still remained of it, contained numerous encysted trichinæ. He found, also, that the farmer and his wife and the butcher had all been ill with symptoms similar, though milder, to those the girl had exhibited.

This case, so complete in itself, not only established the connection between trichina in the hog and in man, but demonstrated the existence of an unsuspected and frightful disease, and explained much that had been mysterious in former cases of death from so-called sausage-poison and other unknown causes. It was followed by other epidemics of a fatal character, in several of which the victims were numbered by scores, so that a panic spread over Europe, and the hog seemed doomed to take his proper position as an unclean beast. Scientific commissions have been appointed by many governments to study the disease, and the natural history of this little worm has become of national and political importance, and has received the attention of some of the best scientific observers of the day.

It being established that man gets the disease from swine, these investigations have been directed to the source of infection in the latter animals. Many immature round worms have been found in animals and accused of being trichinæ, but more careful examinations and experiments have subsequently proved their innocence. Among these are to be mentioned worms found in moles, frogs, insects, and angle-worms, upon which swine are known to feed. Even vegetables have been laid under suspicion, and particularly a little nematoid worm which infests the beet-root, but this, too, was found to be zoölogically distinct. Statements have also been made that beef is not free from trichinæ, but there is no just ground for such reports, and the same may be said of the flesh of birds like ducks, geese, and pigeons, which might receive infection by means of the intestinal discharges of tri-

chinous animals, for it has been found impossible to reproduce them by artificial feeding within these animals.

A committee appointed by the Imperial Society of Physicians, at Vienna, has just presented a report on trichinosis, in which it is stated that the real source of infection in swine lies entirely in the rat. In Moravia, thirty-seven per cent. of the rats examined were found trichinized, in the environs of Vienna about ten per cent., and in Lower Austria the proportion was not more than four per cent. The commission also confirms the results of previous experiments, as to the artificial transmission of the disease from the rat to the cat, to the rabbit, and to the pig by feeding. So far as man is concerned, however, it may be safely stated that his source of infection is practically limited to the hog, and there can be little doubt that the disease is kept up between the two precisely as the tape-worm continues to exist. The report of the Vienna commission, even if corroborated by more extended observations, has only added another source of infection in swine; there still remains the fact that many mature females escape from the intestines after impregnation, and in this way may be eaten by the animals. It is well known that when the diarrhœa is severe during the first stages of an attack of the disease, the patient is not so severely affected as others who have partaken of the same pork, and this is due to the escape of the parasite before the young are born in great quantity, and such persons, not sick enough to keep the house, are the probable sources of infection in swine. It has, in fact, been noticed by Virchow, that epidemics succeed each other at regular intervals. After infecting themselves in the way just described, the swine are not again killed until the next general slaughtering season comes, when another follows, to be succeeded by others after a similar interval. It may also be possible that portions of trichinous flesh may pass through the human intestine unchanged and thus be eaten by other animals, or that rats may eat it, and be subsequently eaten themselves by swine. We have seen that dogs cannot be made trichinous by eating diseased flesh, but they may discharge the contents of their intestines containing partially developed trichinæ where swine have access to them; and lastly, it is not impossible that swine may infect each other by intestinal trichinæ alone.

Trichinosis is no new disease. It existed many years ago, and it is undoubtedly as old as the habit of pork eating; we are only beginning to recognize it. In certain parts of Europe where raw pork is largely eaten in the form of ham and sausages, and where the habits of swine and their keepers are not very unlike, there is ample opportunity afforded for its spread and frequent occurrence. In our own country, too, there have been numerous small outbreaks, in nearly all of which

some of the cases have been fatal. Within the last month six cases of the disease have occurred in this State, one of which proved fatal. They were caused by eating raw ham. The most careful attention, however, will not prevent the accidental infection of these animals, as the history of some of the epidemics illustrates. Unfortunately, the disease is latent in them, producing no symptoms which cause its presence to be suspected, and the appearances of the flesh after death are not such as to attract attention. It can only be recognized by its effect on those who unwarily eat it, or by microscopic examination.

In some parts of Germany government obliges all pork to be inspected by an appointed person, before it is sold, and even the butchers are forming associations among themselves for the same purpose, and are learning the use of the microscope, the present horror of pork affording them leisure for such studies. The inspection, however, should never be intrusted to an incompetent observer, and should be thoroughly performed. One of the latest cases of the disease in Prussia was produced by eating flesh which had passed examination, and subsequent investigation showed that only a portion of the shoulder had been sent for examination, and that other parts were abundantly infected. It has been found that the muscles contain most trichinæ nearest their attachments, and that in ham they occur in greatest numbers in these parts about the lower leg. Every hog should be examined in at least five places before it can be pronounced clean, for the parasites are sometimes distributed in the most unequal manner. In Brunswick, out of twenty thousand swine examined, but two were found to be trichinous, but it will be remembered that each of the two great epidemics in Germany were caused by eating the flesh of one animal alone, but these two animals caused the sickness of five hundred, and the death of over one hundred persons.

The results of the investigations of the Committee of the Chicago Academy of Sciences show, however, that the disease prevails among the swine in our Western States to a much greater extent than in Germany, for of 1,394 animals examined, twenty-eight were found trichinous, or one in fifty. Were the habit of eating raw ham and sausages as prevalent in America as in Germany, it will be seen, therefore, how frequent the disease might become amongst us. Fortunately, thorough cooking destroys the vitality of the young worms, but it should be carried to complete coagulation of all the juices of the flesh, even to its very centre, to be effectual. — J. C. W.

W. H. S., Pennsylvania. — It is quite essential for one who wishes to become a naturalist, to know enough of the Latin Language to be able to read Latin descriptions of species, and know the meaning and

derivation of Latin words. A little study will give one enough knowledge of the language for ordinary practical purposes. A large number of scientific terms are derived from the Greek, some knowledge of which is indispensable to the naturalist.

Mr. George B. Emerson, in an article on the Study of Latin Grammar, published in the Massachusetts Teacher, April, 1867, says that "D'Arcy W. Thompson, a man of genius, now Professor of Greek in Queen's College, Belfast, Ireland, author of the 'Day Dreams of a Schoolmaster,' will engage to put all the Latin Grammar necessary to make a good scholar of a boy, into twenty-four pages of a little work that shall sell for sixpence."

Read also the Inaugural Address, delivered at the University of St. Andrews, Feb. 1, 1867, by John Stuart Mill (published in Littell's Living Age, Boston, No. 1,189). This treats in a very comprehensive way of the study of science and the classics. It should be read by every naturalist.

We shall issue a title-page and full index at the close of each volume of the *Naturalist*.

G. W. P., New York.—The insect you enclose is a False-Scorpion (*Chelifer*). The large claws are adapted for seizing their prey, as the habits of the insect are somewhat like those of the Scorpion, though from its different structure it is more closely allied to the Mites.

## NATURAL HISTORY CALENDAR.

The Insects of June.—In our monthly calendars we propose to notice more fully than heretofore the *injurious* insects. References to the times of their appearance must be necessarily vague, and apply only, in a very general way, to the Northern States. Insects appear in Texas about six weeks earlier than in Virginia, in the Middle States six weeks earlier than in northern New England and the North-western States, and in New England about six weeks earlier than in Labrador. The time of the appearance of insects corresponds to the time of the flowering or leafing out of certain trees and herbs; for instance, the larvæ of the American Tent Caterpillar, and of the Canker-worm, hatch just as the apple-tree begins to leaf out; a little later, the Plant-lice appear, to feast on the tender leaves, and when, during the first week in June, our forests and orchards are fully leaved out, hosts of insects are marshalled to ravage and devour their foliage.

1st to 15th.—Early in the month the Parsnip Butterfly (*Papilio Asterias*) may be seen flying over beds of parsnips, laying its eggs for

the brood of caterpillars which appear in August. At the time of the flowering of the raspberry and blackberry, the young larvæ of *Vanessa Antiopha*, one of our most abundant butterflies, may be found living socially on the leaves of the willow; while the mature larva of another much smaller butterfly, the little Copper Skipper (*Chrysophanus Americanus*), so abundant at this time, may sometimes be found on the clover. It is a short, oval, greenish worm, with very short legs. The dun-colored Skippers (*Hesperia*) abound towards the middle of the month, darting over the flowers of the blueberry and blackberry, in sunny openings in the forests.

The family of Hawk Moths (*Sphinges*) now appear in greater abundance, hovering at twilight over flower-beds, and, during this time, deposit their eggs on the leaves of various fruit-trees. The American Tent Caterpillar makes its cocoon, and assumes the pupa state. The caterpillar passes several days within the cocoon, in what may be called the semi-pupa state, during which period the chrysalis skin is forming beneath the contracted and loosened larva skin. We once experimented on a larva which had just completed its cocoon, to learn how much silk it could produce. On removing its cocoon, it made another of the same thickness; but on destroying this second one, it spun a third but frail web, scarcely concealing its form. A minute Ichneumon parasite, allied to *Platygaster*, lays its eggs within those of this moth, as we once detected one under a bunch of eggs, and afterwards reared a few from the same lot of eggs. A still more minute egg-parasite we have seen ovipositing in the early spring, in the eggs of the Canker-worm. It has been described and figured in Harris' "Treatise on Insects," third edition, p. 471.

Among that beautiful family of Moths, the *Phalænidæ*, comprising the Geometers, Loopers, or Span-worms, are two formidable foes to fruit-growers. The habits of the Canker-worm should be well known. With proper care and well-directed energy we believe their attacks can be in a great measure prevented. The English Sparrow, Doves, and other insectivorous birds, such as are noticed elsewhere in our pages, should be domesticated in order to reduce the number of these pests. More care than has yet been taken should be devoted to destroying the eggs laid in the autumn, and also the wingless females, as they crawl up the trees in the spring and fall to lay their eggs. The evil is usually done before the farmer is well aware that the calamity has fallen upon him. As soon as, and even before the trees have fairly leaved out, they should be visited morning, noon, and night, shaken*

* Read in the "Practical Entomologist" for April, 1867, an account by the Editor, of the Curculio-catcher, and the true method of shaking or jarring trees. This paper is indispensable to the agriculturist. Published by the American Entomological Society at Philadelphia.

and thoroughly examined and cleared of the caterpillars. By well-concerted action among agriculturists, who should form a Board of Destruction, numbering every man, woman, and child on the farm, this fearful scourge may be abated by the simplest means, as the cholera or any epidemic disease can in a great measure be averted by taking proper sanitary precautions. The Canker-worms hatch out during the early part of May, from eggs laid in the fall and spring, on the branches of various fruit-trees. Just as the buds unfold, the young caterpillars make little holes through the tender leaves, eating the pulpy portions, not touching the veins and midribs. When four weeks old they creep to the ground, or let themselves down by spinning a silken thread, and burrow from two to six inches in the soil, where they change to chrysalids in a day or two, and in this state live till late in the fall, or until the early spring, when they assume the imago or moth form. The sexes then unite, and the eggs are deposited for the next generation.

The Canker-worm is widely distributed, though its ravages used to be confined mostly to the immediate vicinity of Boston. We have seen specimens of the moth from New Hampshire, and Norway, Maine, and Michigan. Last October, late in the month, and in November, we observed numbers of them at the White Mountains flying at twilight.

The *Abraxas? ribearia* of Fitch, the well-known Currant-worm, defoliates whole rows of currant-bushes. This pretty caterpillar may be easily known by its body being of a deep golden color, spotted with black. The bushes should be visited morning, noon, and night, and thoroughly shaken (killing the caterpillars) and sprinkled with ashes.

Among multitudes of beetles (*Coleoptera*) injurious to the crops, are the June Bug, *Lachnosterna fusca* (Fig. 1, from Harris), whose larva, a large white grub, is injurious to the roots of grass and to strawberry vines. The Rose-bug appears about the time of the blossoming of the rose. The Fire-flies now show their light during mild evenings, and on hot sultry days the shrill rasping song of the male Cicida, for they "all have voiceless wives," cuts the air. The Chinch-bug, that fell destroyer of our wheat crops appears, according to Harris, in the middle of the month, and "may be seen in their various stages of growth on all kinds of grain, on corn and herds-grass during the whole summer." So widely spread is this insect at present, that we have even detected it in August on the summit of Mount Washington.

Fig. 1.

The Diptera, or two-winged flies, contain hosts of noxious insects, such as the various *Cecidomyians*, or two-winged Gall-flies, which now

sting the culms of the wheat and grasses, and various grains, and leaves of trees, producing gall-like excrescences, of varying form. Legions of these delicate minute flies fill the air at twilight, hovering over wheat-fields and shrubbery. A strong north-west wind, at such times, is of incalculable value to the farmer. Moreover, minute flies, allied to the house-fly, such as *Tephritis*, *Oscinis*, etc., now attack the young cereals, doing immense injury to grain.

Millions of Aphides, or Plant-lice (Fig. 2), now infest our shade and fruit-trees, crowding every green leaf, into which they insert their tiny beaks, sucking in the sap, causing the leaves to curl up and wither. They also attack the stems and even the roots of plants, though these latter (*Pemphigus*) differ generically from the true Plant-lice. Fruit-trees should be again washed and rubbed to kill off the young Bark-lice, of which the common apple Bark-louse (*Aspidiotus conchiformis*), whose oyster-shaped scales may be found in myriads on neglected trees, is a too familiar example. Another pest of apple-trees is the woolly Blight (*Eriosoma lanigera*). These insects secrete from the surface of the body a downy, cottony substance which conceals the animal, and when they are, as usual, grouped together on the trees, look like patches of mould. We figure (Fig. 3) from Harris, the *Coccus adonidum* found on the peach. The natural-insect enemies of the Plant-lice now abound; such are the Lady-bugs (*Coccinella*); the larva of the Syrphus-fly, which devours immense quantities, and the larva of the Golden-eyed, Lace-winged fly (*Chrysopa*).

Fig. 2.

Fig. 3.

15th to 30th. — The last days of June are literally the heyday and jubilee of insect life. The entomological world holds high carnival, though in this country they are, perhaps, more given to mass-meetings and caucuses. The earth, the air, and the water teem with insect-life. The insects of mid-summer now appear. Among the butterflies, the Wood-satyrus (*Neonympha eurythris*) skips in its low flight through the pines. The larva of *Grapta Progne* appears on the currants, while the Currant-borer moth (*Trochilium tipuliforme*) darts about the leaves on hot sunny days. The larva of *Cynthia cardui* may be found on the hollyhocks; the pupa state lasts twelve days, the butterfly appearing in the middle or last of July. The *Hyphantria textor* now lays its smooth, spherical eggs on broad patches on the under side of the leaves of the apple, which the caterpillar will ravage in August; and its ally, the *Halesidota*

*caryæ* we have found ovipositing the last week in the month on the leaves of the butternut. The Squash-bug, *Coreus* (Gonocerus) *tristis*, is now very abundant, gathering about the roots of the Squash vines, often in immense numbers, blackening the stems with their dark, blackish-brown bodies. This insect is easily distinguished from the yellow striped Squash-beetle mentioned in our last number, by its much greater size, and its entirely different structure and habits. It is a true bug (*Hemipter*, of which the bed-bug is an example), piercing the leaves and stalks, and drawing out the sap with its long sucker.

A. S. P.

## PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Essex Institute. *Salem, Feb.* 18, 1867.—Mr. N. E. Atwood, of Provincetown, presented some observations on the different species of whales, and alluded to their food. The Sperm Whale feeds principally upon the Squid, or Cuttle-fish. The favorite food of the Right Whale consists of small crustaceans, medusæ, etc. The Finbacks feed on menhaden, and other small fishes. He then spoke of the relative size of the sexes. The males of the Sperm Whale have yielded as largely as one hundred and forty barrels of oil, whereas the females only yielded from fifteen to twenty barrels. Among the Humpbacks, the females exceed the males in size.

Mr. E. Bicknell made a few remarks upon the microscopic structure of whalebone, stating that, in his opinion, in addition to serving as a strainer to catch the food of the whale, the fringe of hairs, with which each blade is furnished on its inner edge, serves as an organ of touch, notifying it of the presence of its food. This theory is based upon the fact of the hairs being but the termination of a series of tubes, which are continuous from their base to their termination in free ends, and which are filled with a vascular pulp, which he had no doubt contained a nervous substance. The examination of pieces of fresh whalebone would be sufficient to decide the question.

Academy of Natural Sciences. *Philadelphia, March* 12.—Prof. E. D. Cope exhibited a specimen of the skull of a large turtle in a matrix of soft granular limestone, from the cretaceous marl at Barnesboro, Camden County, New Jersey. It was of great interest, not only from the rarity of fossil Chelonian crania in our collections, but from its peculiar structural features. Prof. Ennis remarked on the "Physical Condition and Habits of the Gipsies."